Number Properties and Operations

Middle grades students understand fractions, decimals, percents and integers, compare them and locate their relative positions on a number line. They develop and use proportional reasoning to solve problems. They work with large numbers and small numbers. They use factors, multiples and prime factorizations. They perform arithmetic operations with fractions, decimals and integers, use properties in computation, develop fluency and develop strategies to estimate the result of operations on rational numbers.

6th Grade	7th Grade	8th Grade
Number Sense		
MA-M6-1.1.1 **Students will describe properties of fractions, decimals, and percents, and will use these numbers to solve real-world and/or mathematical problems.** *MA-M6-1.1.1a* *Students will describe and give examples of the place value of whole numbers and decimals and representations of fractions, decimals, percents, and their operations in real-world and/or mathematical situations.*	**MA-M7-1.1.1** **Students will describe the properties of integers, fractions, decimals, percents, and π, and will use these numbers to solve re-world and/or mathematical problems.** *MA-M7-1.1.1a* *Students will describe and give examples of representations of whole numbers, fractions, decimals, percents and integers (including addition of integers) in a variety of equivalent forms, based on real-world and or mathematical situations.*	**MA-M8-1.1.1** **Students will describe the properties of rational numbers and irrational numbers (square roots and π only), and will use these numbers to solve real-world and/or mathematical problems.** *MA-M8-1.1.1a* *Students will describe and give examples of representations of numbers and operations in a variety of equivalent forms using models, diagrams, and symbols (e.g., number lines, 10 by 10 grids, rectangular arrays, number sentences), based on real-world and/or mathematical situations.*
MA-M6-1.1.2 **Students will convert among whole numbers, fractions, decimals, and percents, and will order and compare these numbers.**	**MA-M7-1.1.2** **Student will convert among whole numbers, fractions, decimals, percents, and π, and will order and compare these numbers.**	**MA-M8-1.1.2** **Students will convert among rational numbers, and will order and compare rational numbers and irrational numbers (square roots and π only).**
Estimation		
MA-M6-1.2.1 **Students will estimate to solve real-world and/or mathematical problems with whole numbers, fractions, decimals, and percents, checking for reasonable and appropriate computational results.**	**MA-M7-1.2.1** **Students will estimate to solve real-world and/or mathematical problems with fractions, decimals, and percents, checking for reasonable and appropriate computational results.**	**MA-M8-1.2.1** **Students will estimate to solve real-world and/or mathematical problems with rational numbers, checking for reasonable and appropriate computational results.**
Number Operations		
MA-M6-1.3.1 **Students will identify and describe when addition, subtraction, multiplication and**	**MA-M7-1.3.1** **Students will identify and describe when addition, subtraction, multiplication and**	**MA-M8-1.3.1** **Students will identify and describe when addition, subtraction, multiplication and**

division are appropriate in real-world and mathematical situations, and use algorithms and order of operations to solve real-world and mathematical problems involving fractions and decimals. *MA-M6-1.3.1a* *Students will explain how operations (addition and subtraction; multiplication and division) are inversely related.* *MA-M6-1.3.1b* *Students will check for reasonable and appropriate computational results, using a variety of methods (e.g., estimate, pencil and paper, calculator, rounding, mental math).*	**division are appropriate in real-world and mathematical situations, and use algorithms and order of operations (including positive whole number exponents) to solve real-world and mathematical problems involving fractions and decimals.** *MA-M7-1.3.1a* *Students will explain how operations (addition and subtraction; multiplication and division) are inversely related.* *MA-M7-1.3.1b* *Students will check for reasonable and appropriate computational results, using a variety of methods (e.g., estimate, pencil and paper, calculator, round, mental math).*	**division are appropriate in real-world and mathematical situations, and use algorithms and order of operations (including positive whole number exponents) to solve real-world and mathematical problems involving rational numbers.** *MA-M8-1.3.1a* *Students will explain how operations (additions and subtraction; multiplication and division; squaring and taking the square root of a number) are inversely related.* *MA-M8-1.3.1b* *Students will check reasonable and appropriate computational results, using a variety of methods (e.g., estimate, pencil and paper, calculator, round, mental math).*
Ratios and Proportional Reasoning		
MA-M6-1.4.1 **Students will describe properties of and give examples of ratios, and use ratios to solve real-world and/or mathematical problems.**	**MA-M7-1.4.1** **Students will use proportional reasoning to solve real-world (e.g., percentage, sales tax, discounts, rate) and/or mathematical problems.**	**MA-M8-1.4.1** **Students will use ratios and proportional reasoning to solve real-world (e.g., constant rate of change, unit pricing, increase, decrease) and/or mathematical problems.**
Properties of Numbers and Operations		
MA-M6-1.5.1 **Students will identify and use prime numbers, composite numbers, prime factorization, factors, multiples, and divisibility to solve real-world and/or mathematical problems (e.g., prime factorization to determine a least common multiple [LCM] or greatest common factor [GCF]).**	**MA-M7-1.5.1** **Students will identify and use prime numbers, composite numbers, prime factorization, factors, multiples and divisibility to solve real world and/or mathematical problems (e.g., prime factorization to determine a least common multiple [LCM] or greatest common factor [GCF]).**	
MA-M6-1.5.2 **Students will explain how the commutative properties, the associative properties, and the identity properties for addition and multiplication are used to simplify numerical expressions.**	**MA-M7-1.5.2** **Students will explain how the commutative properties, the associative properties, and the identity properties for addition and multiplication are used to justify a given step in solving problems.**	**MA-M8-1.5.2** **Students will explain how the commutative properties, the associative properties, the distributive property, the identity properties for addition and multiplication, and inverse relationships are used to justify a given step in solving problems.**

Measurement
Students continue to measure and estimate measurements including fractions and decimals. They use formulas to find perimeter, area, circumference and volume. They use rulers and protractors. They use US Customary and metric units of measurement.

6th Grade	7th Grade	8th Grade
Measuring Physical Attributes		
MA-M6-2.1.1 **Students will find measures of rectangles and figures that can be divided into rectangular shapes, including lengths to the nearest eighth of an inch or nearest centimeter, and will find the area and perimeter of triangles and quadrilaterals (rectangles, squares). (Using the Pythagorean theorem will not be required as a strategy.)** *MA-M6-2.1.1a* *Students will estimate measurements in standard units including fractions and decimals.* *MA-M6-2.1.1b* *Students will explain how measurements and measurement formulas are related or different (perimeter and area of rectangles).*	**MA-M7-2.1.1** **Students will find measures of both regular and irregular polygons, including length to the nearest eighth of an inch or nearest centimeter, will find the area and perimeter of triangles and quadrilaterals (rectangles, squares, trapezoids), and will find the area and circumference of circles. (Using the Pythagorean theorem will not be required as a strategy.)** *MA-M7-2.1.1a* *Students will estimate measurements of regular and irregular polygons and circles in standard units.* *MA-M7-2.1.1b* *Students will explain how measurements and measurement formulas are related or different (e.g., perimeter and area of rectangles).*	**MA-M8-2.1.1** **Students will find measures of both regular and irregular shapes, including lengths to the nearest sixteenth of an inch or the nearest millimeter, will find the area and perimeter of triangles and quadrilaterals, and will find the area and circumference of circles.** *MA-M8-2.1.1a* *Students will estimate measurements in standard units in real world and/or mathematical situations.* *MA-M8-2.1.1b* *Students will explain how measurements and measurement formulas are related or different (perimeter and area; rate, time, and distance; circumference and area of a circle).*
		MA-M8-2.1.2 **Students will find the measures of angles by estimation and measurement with a protractor or angle ruler.**
		MA-M8-2.1.3 **Students will use formulas to find the volume of rectangular prisms in real-world and/or mathematical situations.** *MA-M8-2.1.3a* *Students will use formulas to find surface area of rectangular prisms in real world and/or mathematical situations.*

		MA-M8-2.1.4 **Students will use the Pythagorean theorem to find the hypotenuse of a right triangle.**
Systems of Measurement		
MA-M6-2.2.1a *Students will describe and give examples of U.S. Customary and metric units of measurement and use these units to solve real-world and/or mathematical problems.*	*MA-M7-2.2.1a* *Students will describe and give examples of U.S. Customary and metric units of measurement and use these units to solve real-world and/or mathematical problems.*	**MA-M8-2.2.1** **Students will describe and give examples of U.S. Customary and metric units of measurement and use these units to solve real-world and/or mathematical problems.**

Geometry Middle grade students expand analysis of two-dimensional shapes and three-dimensional shapes. They translate shapes in a coordinate plane. They extend work with congruent and similar figures, including proportionality. They use the Pythagorean theorem.		
6th Grade	**7th Grade**	**8th Grade**
Shapes and Relationships		
MA-6-3.1.1 **Students will identify, describe, define, label, and give examples of the basic geometric elements (points, rays, lines, segments, angles [acute, right, obtuse], planes, radius, diameter, circumference).**	*MA-M7-3.1.1a* *Students will describe, give examples of, and identify (using correct notation, label, and name) the basic geometric elements (e.g., points, segments, rays, lines, angles, and planes), including both real world and/or mathematical situations.*	*MA-M8-3.1.1a* *Students will describe and give examples of, basic geometric elements that include points, segments, rays, lines, angles, and planes, and will use these elements in real-world and/or mathematical situations.*
MA-M6-3.1.2 **Students will identify, describe, and give examples and properties of two-dimensional shapes (circles, triangles, quadrilaterals, regular polygons), and will use these properties and shapes to solve real-world and/or mathematical problems.**	**MA-M7-3.1.2** **Students will identify, describe, and give examples and properties (e.g., sides, vertices, angles, congruent parts) of two-dimensional shapes (circles, triangles [acute, right, obtuse, scalene, isosceles, equilateral], quadrilaterals [square, rectangles, rhombus, parallelogram, trapezoid], regular polygons), and will use these properties and shapes to solve real-world and/or mathematical problems.**	**MA-M8-3.1.2** **Students will compare and contrast properties of two-dimensional shapes (circles, triangles acute, right, obtuse, scalene, isosceles, equilateral], quadrilaterals [square, rectangles, rhombus, parallelogram, trapezoid], regular/irregular polygons), and will use these properties and shapes to solve real-world and/or mathematical problems.**
MA-M6-3.1.3a *Students will describe, give examples of, and identify characteristics (e.g., vertices, angles, faces, edges, congruent parts) of common three-dimensional shapes (spheres, cones, cylinders, prisms, and pyramids).*	*MA-M7-3.1.3 b* *Students will describe, give examples of, and identify characteristics (e.g., vertices, angles, faces, edges, congruent parts) of common three-dimensional shapes (spheres, cones, cylinders, prisms, and pyramids)*	**MA-M8-3.1.3** **Students will compare and contrast properties of three-dimensional shapes (spheres, cones, cylinders, prisms, pyramids), and will use these properties and shapes to solve real-world and/or mathematical problems.**

MA-M6-3.1.4 **Students will describe and give examples of congruent and similar figures, and will use congruent and similar figures to solve real-world and/or mathematical problems.**	**MA-M7-3.1.4** **Students will describe and give examples of congruent and similar figures, and will use congruent and similar figures to solve real-world and/or mathematical problems.**	**MA-M8-3.1.4** **Students will describe and give examples of congruent and similar figures; will use congruent and similar figures to solve real-world and/or mathematical problems, and will use proportional reasoning to solve problems involving scale drawings and similar figures.**
Transformations of Shapes		
MA-M6-3.2.1a *Students will describe, give examples of, and apply line symmetry to real world and/or mathematical situations.*		*MA-M8-3.2.1a* *Students will describe, give examples of, and apply to real world and/or mathematical situations rotational symmetry (90º, 180º, 360º).*
MA-M6-3.2.2 **Students will translate and reflect (across a horizontal or vertical line) shapes in the first quadrant of the coordinate plane and determine new coordinates of the shape after transformation.** *MA-M6-3.2.2b* *Students will move shapes in Quadrant I of the coordinate plane: rotate (turn)*	*MA-M7-3.2.2a* *Students will translate (slide) and reflect (flip) shapes in a coordinate plane*	**MA-M8-3.2.2** **Students will translate, reflect, and dilate (with the center of dilation at the origin) shapes in a coordinate plane and determine new coordinates of the shape after the transformation.** *MA-M8-3.2.2a* *Students will rotate (clockwise or counterclockwise) about the origin, shapes in a coordinate plane.*
Coordinate Geometry		
MA-M6-3.3.1 **Students will graph ordered pairs on a positive coordinate system, will identify graphing terminology (origin, axes, ordered pairs), and will use the coordinate system to solve real-world and/or mathematical problems.**	**MA-M7-3.3.1** **Students will graph ordered pairs on a coordinate system, will identify graphing terminology (origin, axes, ordered pairs), and will use the coordinate system to solve real-world and/or mathematical problems.**	**MA-M8-3.3.1** **Students will graph ordered pairs on a coordinate system, will identify graphing terminology (origin, axes, ordered pairs), and will use the coordinate system to solve real-world and/or mathematical problems.**

Data Analysis and Probability Middle grades students extend the early development of data representations and examine the appropriateness of graphs and representations of data. They examine central tendencies and dispersion. They develop organized approaches to counting and use experimental and theoretical probabilities.		
6th Grade	**7th Grade**	**8th Grade**
Representations of Data Sets		
MA-M6-4.1.1 **Students will read/interpret, analyze, and make inferences from data displays (drawings, tables/charts, pictographs, bar graphs, circle graphs, line plots, Venn diagrams, line graphs, stem-and-leaf plots).** *MA-M6-4.1.1a* *Students will explain how different representations of data (e.g., tables, graphs, diagrams, plots) are related.*	**MA-M7-4.1.1** **Students will read/interpret, analyze, and make inferences from data displays (drawings, tables/charts, pictographs, bar graphs, circle graphs, line plots, Venn diagrams, line graphs, stem-and-leaf plots, scatter plots).** *MA-M7-4.1.1a* *Students will explain how different representations of data (e.g., tables, graphs, diagrams, plots) are related.* *MA-M7-4.1.1b* *Students will read/interpret, analyze, and make inferences from box and whisker of data and make predictions and draw conclusions from the data.*	**MA-M8-4.1.1** **Students will read/interpret, analyze, and make inferences from data displays (drawings, tables/charts, pictographs, bar graphs, circle graphs, line plots, Venn diagrams, line graphs, stem-and-leaf plots, scatter plots, histograms, box-and-whiskers plots).** *MA-M8-4.1.1a* *Students will explain how different representations of data (e.g., tables, graphs, diagrams, plots) are related.*
MA-M6-4.1.2 **Students will organize and construct data displays (pictographs, bar graphs, line plots, Venn diagrams, tables, line graphs, stem-and-leaf plots, circle graphs), and will explain why the type of display is appropriate for the data.**	**MA-M7-4.1.2** **Students will organize and construct data displays (pictographs, bar graphs, line plots, Venn diagrams, tables, line graphs, stem-and-leaf plots, circle graphs, scatter plots), and will explain why the type of display is appropriate for the data.** *MA-M7-4.1.2a* *Students will make decisions about how misleading representations affect interpretations and conclusions about data (e.g. changing the scale on a graph).*	**MA-M8-4.1.2** **Students will organize and construct data displays (pictographs, bar graphs, line plots, Venn diagrams, tables, line graphs, stem-and-leaf plots, circle graphs, scatter plots, box-and-whiskers plots), will explain why the type of display is appropriate for the data, and will explain how misleading representations affect interpretations and conclusions about data (e.g., changing the scale on a graph).**

Characteristics of Data Sets		
MA-M6-4.2.1 **Students will determine the mean, median, mode, and range of a set of data.**	**MA-M7-4.2.1** **Students will determine the mean, median, mode, and range of a set of data, and will recognize clusters, gaps, and outliers within the data.**	**MA-M8-4.2.1** **Students will determine the mean, median, mode, and range of a set of data, will recognize clusters, gaps, and outliers within the data, and will use these concepts to compare sets of data.**
Experiments and Samples		
		MA-M8-4.3.1a *Students will explain how data gathering, bias issues, and faulty data analysis, can affect the results of data collection*
Probability		
MA-M6-4.4.1 **Students will describe or generate (e.g., tables, tree diagrams) the sample space of an event.**	**MA-M7-4.4.1** **Students will use counting techniques to determine the size of a sample space.**	**MA-M8-4.4.1** **Students will sue counting techniques to determine the size of a sample space.**
MA-M6-4.4.2 **Students will determine simple probabilities based on the results of an experiment, will make predictions, and will draw inferences.**	**MA-M7-4.4.2** **Students will determine theoretical probabilities of simple events, will determine probabilities based on the results of an experiment, will make predictions, and will draw inferences.** *MA-M7-4.4.2a* *Students will tabulate experimental results from simulations and explain how theoretical and experimental probabilities are related.*	**MA-M8-4.4.2** **Students will determine theoretical probabilities of simple events, will determine probabilities based on the results of an experiment, will make predictions, and will draw inferences.** *MA-M8-4.4.2a* *Students will tabulate experimental results from simulations and explain how theoretical and experimental probabilities are related.* *MA-M8-4.4.2b* *Students will determine theoretical probabilities and represent them using area models.*

Algebraic Thinking Middle grade students extend pattern work to include arithmetic sequences. They use linear functions and linear equations. They plot rational number pairs in the Cartesian plane. They simplify algebraic and numeric expressions. They explore the effects of change on related variables. They use and solve two-step single variable equations and inequalities.		
6th Grade	**7th Grade**	**8th Grade**
Patterns, Relations, and Functions		
MA-M6-5.1.1 **Students will identify, extend, create, and describe rules for patterns from real-world and/or mathematical problems.**	**MA-M7-5.1.1** **Students will identify, extend, create, and describe rules for patterns from real-world and/or mathematical problems.**	*MA-M8-5.1.1a* *Students will use variables to describe numerical patterns based on arithmetic sequences in real world and/or mathematical situations (i.e. $f(N)=2N+3$).*
MA-M6-5.1.2 **Students will create tables for functions and will use the tables to solve real-world and/or mathematical problems.** *MA-M6-5.1.2a* *Students will describe, define, give examples of, and apply to real world and/or mathematical situations functions using tables, graphs and verbal rules.* *MA-M6-5.1.2b* *Students will explain how tables and graphs and patterns relate to each other*.	**MA-M7-5.1.2** **Students will represent, analyze, and generalize functions with tables, graphs, and words, and will use the functions to solve real-world and/or mathematical problems.** *MA-M7-5.1.2a* *Students will explain how tables, graphs, patterns, verbal rules, and equations relate to each other*	**MA-M8-5.1.2** **Students will represent, analyze, and generalize functions with tables, graphs, and words, and will use the functions to solve real-world and/or mathematical problems.** *MA-M8-5.1.2a* *Students will write equations for arithmetic (linear) sequences (nth term).*
MA-M6-5.1.3a *Students will explain how the change in one quantity affects change in another quantity (e.g., in tables or graphs, input/output tables).*	**MA-M7-5.1.3** **Students will explain how the change in one quantity affects the change in another quantity (e.g., in tables or graphs).**	**MA-M8-5.1.3** **Students will explain how the change in one variable affects the change in another variable (e.g., if rate remains constant, an increase in time results in an increase in distance).**

Variables, Expressions, and Operations		
MA-M6-5.2.1 **Students will substitute values in for variables (up to two different variables) and evaluate algebraic expressions.** *MA-M6-5.2.1a* *Students will describe, define, and give examples of variables and expressions with a missing value based on real-world and/or mathematical situations.*	**MA-M7-5.2.1** **Students will substitute values in for variables (up to three different variables) and evaluate algebraic expressions.** *MA-M7-5.2.1a* *Students will describe, define, and give examples of variables and expressions with a missing value based on real-world and/or mathematical situations.*	**MA-M8-5.2.1** **Students will evaluate numerical and will simplify algebraic expressions using the order of operations.** *MA-M8-5.2.1a* *Students will describe, define, and give examples of variables and expressions with a missing value based on real-world and/or mathematical situations.*
Equations and Inequalities		
MA-M6-5.3.1 **Students will represent and write simple equations and inequalities (e.g., 8x=4, x+2>5), and will use them to solve real-world and/or mathematical problems.**	**MA-M7-5.3.1** **Students will represent and write one- and two-step single variable equations and inequalities (e.g., 2x+1=9, 3x+3<9), and will use them to solve real-world and/or mathematical problems. (Statements and solutions use only non-negative numbers.)**	**MA-M8-5.3.1** **Students will represent and write one- and two-step single variable equations and inequalities, e.g., 4x+2=22, x-4<-60), and will use them to solve real-world and/or mathematical problems.**